10th Class 2017

Chemistry	Group-I	Paper-II
Time: 1.45 Hours	(Subjective Type)	Marks: 48

(Part-I)

2. Write short answers to any FIVE (5) questions: 10

(i) Define irreversible reaction.

Ans The reaction, in which the product does not combine to form reactants, is called irreversible reaction.

(ii) Define equilibrium state.

Ans When the rate of the forward reaction takes place at the rate of reverse reaction, the composition of the reaction mixture remains constant, it is called a chemical equilibrium state.

(iii) Give any two characteristics of reverse reaction.

Ans The two characteristics of reverse reaction are:

1. It is a reaction in which products react to produce reactants.
2. It takes place from right to left.

(iv) Define organic compound.

Ans Organic compounds are hydrocarbons (compounds of carbon and hydrogen) and their derivatives, in which covalently bonded carbon is an essential constituent.

(v) Give two characteristic properties of bases.

Ans The two characteristics properties of bases are:

1. They have bitter taste and feel slippery, *e.g.*, soap is slippery to touch.
2. They turn red litmus blue.

(vi) What is conjugate acid? Define it.

Ans A conjugate acid is a specie formed by accepting a proton by a base.

(vii) Which acid is present in apples?

Ans Malic acid is present in apples.

(viii) Define pH. What is the pH of pure water?

Ans pH is the negative logarithm of molar concentration of the hydrogen ions, *i.e.*, pH = $-\log [H^+]$.

The pH value of pure water is 7.

3. Write short answers to any FIVE (5) questions: 12

(i) Write formula of carboxyl group. Give an example of carboxylic acid.

Ans Compounds containing functional group

$$-\overset{\overset{\large O}{\|}}{C}-OH$$

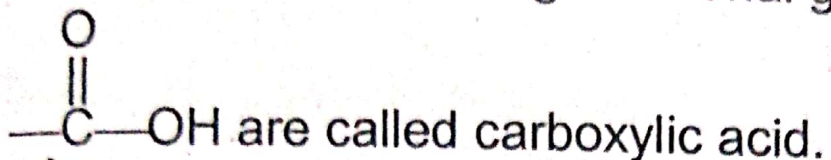
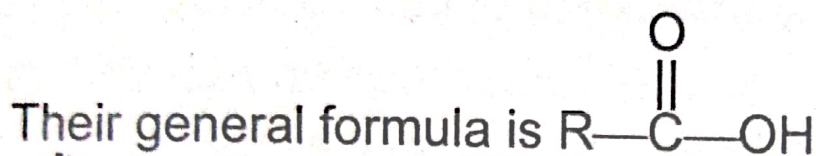
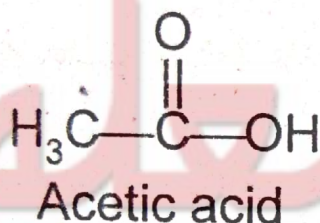
are called carboxylic acid.

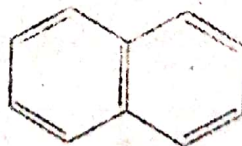
Formula:

Their general formula is $R-\overset{\overset{\large O}{\|}}{C}-OH$

Example:

$$H_3C-\overset{\overset{\large O}{\|}}{C}-OH$$

Acetic acid

(ii) What are aromatic compounds? Give an example.

Ans Aromatic organic compounds contain at least one benzene ring in their molecule. A benzene ring is made up of six carbon atoms with three alternating double bonds. They are called aromatic because of aroma or smell, they have. For example,

Benzene Naphthalene

They are also called benzenoid compounds.

(iii) Write any two properties of homologous series.

Ans **Properties of homologous series:**

1. The successive members of the series differ by one unit of $-CH_2-$ and 14 units in their relative molecular mass.

2. They have similar chemical properties, because they contain the same functional group.

(iv) Define hydro-carbons.

Ans Hydro-carbons are the compounds made up of only two elements carbon and hydrogen.

(v) Describe any two uses of methane and ethane.

Ans Two uses of Methane and Ethane are following:

1. Natural gas that is chiefly methane is used as domestic fuel.
2. Compressed natural gas (CNG) is used as automobile fuel.

(vi) Give the characteristics of disaccharides (any two).

Ans Following are two characteristics of disaccharides:

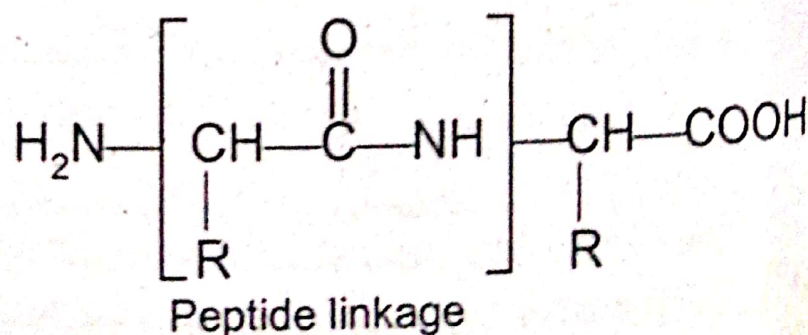
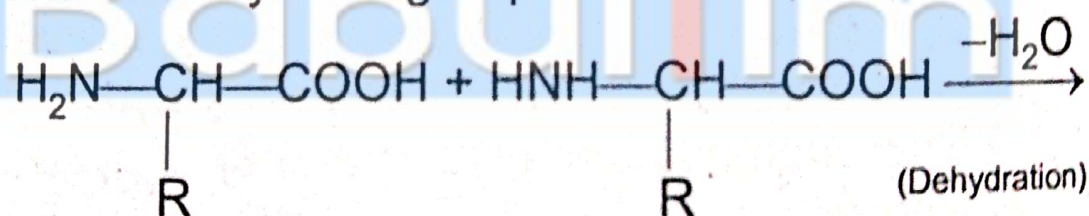
1. All disaccharides are soluble in water.
2. They are sweet in taste.

(vii) How do you justify that the amino acids are the building blocks of proteins?

Ans Two amino acids link through peptide linkage. Peptide linkage (bond) is formed by the elimination of water molecule between the amino group of one amino acid and carboxyl acid group of another, such as:

$$H_2N-\underset{\displaystyle R}{\underset{|}{CH}}-COOH + HNH-\underset{\displaystyle R}{\underset{|}{CH}}-COOH \xrightarrow[\text{(Dehydration)}]{-H_2O}$$

$$H_2N-\left[\underset{\displaystyle R}{\underset{|}{CH}}-\overset{\displaystyle O}{\overset{||}{C}}-NH\right]-\underset{\displaystyle R}{\underset{|}{CH}}-COOH$$

Peptide linkage

(viii) Write two sources of vitamin D.

Ans The sources of vitamin D are fish liver, dairy products, oils and fats. Vitamin D is formed in the skin when it is exposed to sunlight.

4. Write short answers to any FIVE (5) questions: 10

(i) **Write two effects of global warming.**

Ans Here are two effects of global warming:

1. Due to global warming, there are great changes in the weather conditions.
2. It melts the glaciers and snow-caps that increase the flood risks and tropical cyclones.

(ii) **Describe primary pollutants and secondary pollutants.**

Ans **Primary pollutants** are the waste or exhaust products driven out because of combustion of fossil fuels and organic matter. These are oxides of sulphur (SO_2 and SO_3); oxides of carbon (CO_2 and CO); oxides of nitrogen (specially nitric oxide NO); hydrocarbon (CH_4); ammonia and compounds of fluorine.

Secondary pollutants are produced by various reactions of primary pollutants. These are sulphuric acid, carbonic acid, nitric acid, hydrofluoric acid, ozone and peroxy acetyl nitrate (PAN).

(iii) **Point out two serious effects of ozone depletion.**

Ans The two serious effects of ozone depletion are:

1. The decreased ozone layer will increase infectious diseases like malaria.
2. It can change the life cycle of plants disrupting the food chain.

(iv) **Write two properties of water.**

Ans The two properties of water are as follows:

1. The freezing point of water is $0^{\circ}C$ and boiling point is $100^{\circ}C$ at sea level.
2. Its maximum density is g cm^{-3} at $4^{\circ}C$.

(v) **What are dysentery and typhoid?**

Ans **Dysentery:**

It is an intestinal disease caused by certain bacteria or parasites. Severe diarrhoea along with blood or mucous is caused by this disease.

Typhoid:

This is a bacterial disease spread by contaminated water or by the food prepared by the contaminated water.

(vi) Write name of raw materials which are used in Solvay's process.

Ans Following are the raw materials which are used in Solvay's process:

1. Sodium chloride (NaCl) or brine.
2. Limestone ($CaCO_3$).
3. Ammonia gas (NH_3).

(vii) Write two advantages of Solvay's process.

Ans The two advantages of Solvay's process are:

1. It is a cheap process. The material required for this process is available at low price.
2. In this process, CO_2 and ammonia are recovered and re-used.

(viii) Write two important uses of urea.

Ans **Uses of urea:**

1. Urea is used as a fertilizer.
2. It is used to make explosives.

(Part-II)

NOTE: Attempt any TWO (2) questions.

Q.5.(a) State the Law of Mass Action and derive the expression for equilibrium constant for a general reaction. (5)

Ans **Law of Mass Action:**

This law states that "The rate at which a substance reacts is directly proportional to its active mass and the rate of reaction is directly proportional to the product of active masses of the reacting substances."

Consider a general reversible reaction:

$$A + B \underset{K_r}{\overset{K_f}{\rightleftharpoons}} C + D$$

Suppose [A], [B], [C] and [D] are the molar concentrations of A, B, C and D.

Then according to the law of mass action,

Rate of forward reaction $\propto [A][B]$

$= k_f [A][B]$

Similarly, rate of reverse reaction $\propto [C][D]$

$= k_r[C][D]$

where k_f and k_r are called as proportionality constants called as specific rate constants of the forward and reverse reactions, respectively.

At equilibrium state:

Rate of forward reaction = Rate of reverse reaction

$k_f [A] [B] = k_r [C][D]$

$$\frac{k_f}{k_r} = \frac{[C]\,[D]}{[A]\,[B]} \qquad \left[\text{where } \frac{k_f}{k_r} = k_c\right]$$

$$k_c = \frac{[C][D]}{[A]\,[B]}$$

Where 'k_c' is an equilibrium constant.

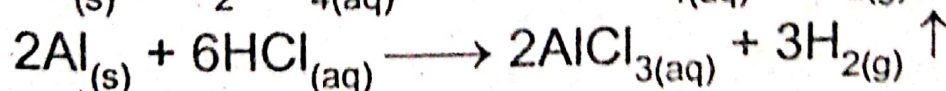
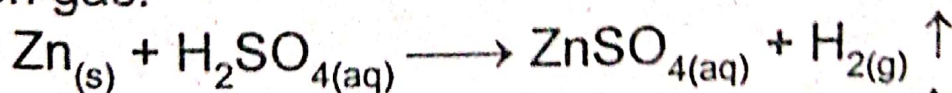
(b) Write four chemical properties of acid. **(4)**

Ans Chemical Properties:

(i) Reaction with Metals:

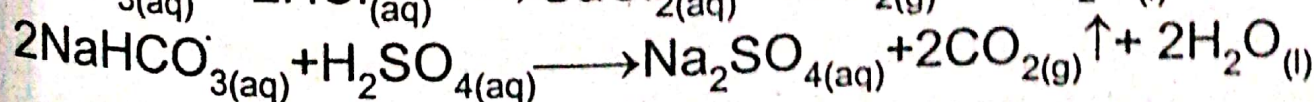
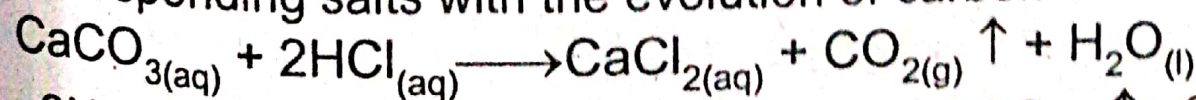
Acids react explosively with metals like sodium, potassium and calcium. However, dilute acids (HCl, H_2SO_4) react moderately with reactive metals like: Mg, Zn, Fe and Al to form their respective salts with the evolution of hydrogen gas.

$$Zn_{(s)} + H_2SO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + H_{2(g)} \uparrow$$

$$2Al_{(s)} + 6HCl_{(aq)} \longrightarrow 2AlCl_{3(aq)} + 3H_{2(g)} \uparrow$$

(ii) Reaction with Carbonates and Bicarbonates:

Acids react with carbonates and bicarbonates to form corresponding salts with the evolution of carbon dioxide gas.

$$CaCO_{3(aq)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + CO_{2(g)} \uparrow + H_2O_{(l)}$$

$$2NaHCO_{3(aq)} + H_2SO_{4(aq)} \longrightarrow Na_2SO_{4(aq)} + 2CO_{2(g)} \uparrow + 2H_2O_{(l)}$$

(iii) Reaction with Bases:

Acids react with bases (oxides and hydroxides of metal and ammonium hydroxide) to form salts and water. This process is called neutralization.

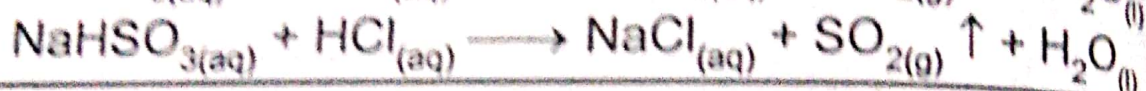
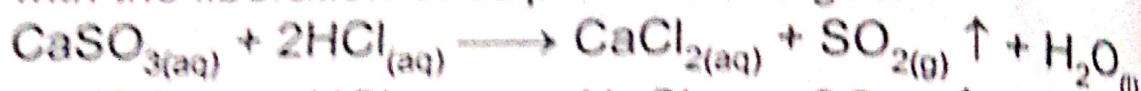
$$NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$$

$$CuO_{(aq)} + H_2SO_{4(aq)} \longrightarrow CuSO_{4(aq)} + H_2O_{(l)}$$

(iv) Reaction with Sulphites and Bisulphites:

Acids react with sulphites and bisulphites to form salts with the liberation of sulphur dioxide gas.

$$CaSO_{3(aq)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + SO_{2(g)} \uparrow + H_2O_{(l)}$$

$$NaHSO_{3(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + SO_{2(g)} \uparrow + H_2O_{(l)}$$

Q.6.(a) Write down any five physical properties of alkanes. (4)

Ans **Physical Properties of Alkanes:**

(i) Alkanes form a homologous series of compounds. First four members of the series are gases. The alkanes consisting of C_5 to C_{10} are liquids while higher members of the series are solids.

(ii) They are nonpolar, therefore, they are insoluble in water but soluble in organic solvents.

(iii) The density of alkanes increases gradually with the increase of molecular size.

(iv) The melting and boiling points of alkanes increase regularly with the increase of molecular sizes. This is because of increase of attractive forces between the molecules of alkanes.

(v) The alkanes become more viscous as their molecular sizes increase.

(b) Describe any four uses of carbohydrates. (3)

Ans **Uses of Carbohydrates:**

The important uses of carbohydrates are as follows:

(i) They regulate the amount of sugar level in our body.

(ii) They provide essential nutrients to bacteria in intestinal tract that help in digestion.

(iii) Dietary fibres help to keep the bowl functioning properly.

(iv) Fibres help in lowering the cholesterol level and regulate the blood pressure.

Q.7.(a) Write importance and status of urea. (4)

Ans **Importance and status of urea:**

Urea is a white crystalline organic compound. There are 6 units for manufacturing of urea in Pakistan.

(i) Urea is used as nitrogenous fertilizer. It contains comparatively more nitrogen than any other nitrogenous fertilizer. It is also used as additional food for animals.

(ii) It is used in the manufacturing of explosives.

(iii) It is not poisonous and flameable. Therefore, it can be stored very easily.

(iv) It is also used as raw material for the manufacturing of various other substances.

(v) It is used in automobile systems to reduce NO_2 pollutants.

(b) Explain the methods of removing hardness in water. (3)

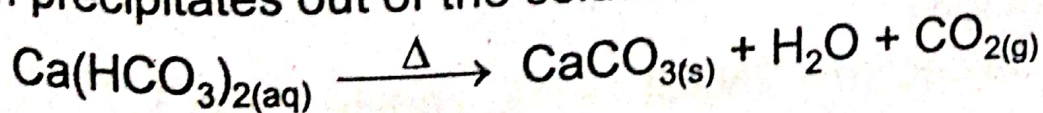
Ans **Methods of Removing Hardness:**

The removal of Mg^{2+} and Ca^{2+} ions which are responsible for the hardness is called water softening.

(i) Removal of temporary hardness:

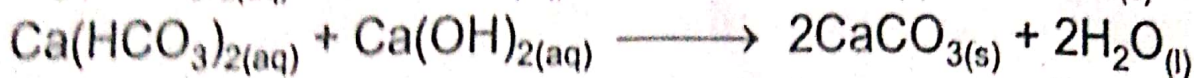
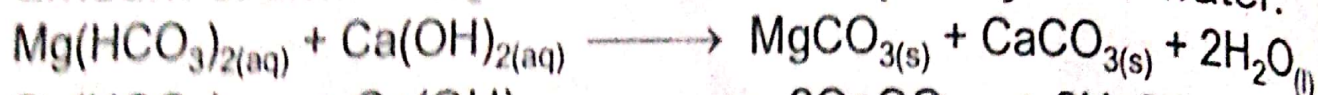
(a) By boiling:

Temporary hardness of water is easily removed by boiling water. On boiling, calcium bicarbonate $Ca(HCO_3)_2$ decomposes to produce insoluble calcium carbonate, which precipitates out of the solution.

$$Ca(HCO_3)_{2(aq)} \xrightarrow{\Delta} CaCO_{3(s)} + H_2O + CO_{2(g)}$$

(b) Clark's method:

A chemical method to remove temporary hardness is by the addition of slaked lime $Ca(OH)_2$. A calculated amount of lime water is added to temporary hard water.

$$Mg(HCO_3)_{2(aq)} + Ca(OH)_{2(aq)} \longrightarrow MgCO_{3(s)} + CaCO_{3(s)} + 2H_2O_{(l)}$$

$$Ca(HCO_3)_{2(aq)} + Ca(OH)_{2(aq)} \longrightarrow 2CaCO_{3(s)} + 2H_2O_{(l)}$$

Thus, once the magnesium and calcium ions precipitate out water becomes soft.

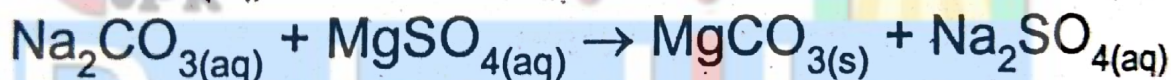
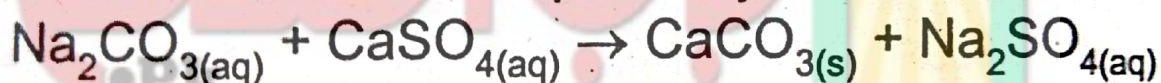
(ii) Removal of permanent hardness:

Permanent hardness can only be removed by using chemicals. Calcium (Ca^{2+}) and magnesium (Mg^{2+}) are removed as insoluble salts by adding washing soda (Na_2CO_3) or sodium zeolite.

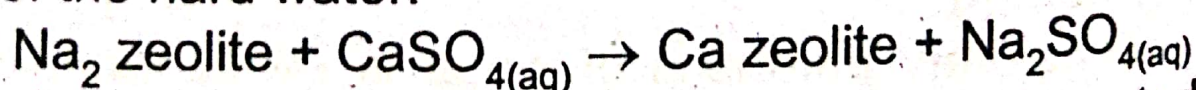
(a) By Using Washing Soda:

The addition of washing soda removes the calcium and magnesium ions as the insoluble calcium and magnesium carbonates, respectively.

$$Na_2CO_{3(aq)} + CaSO_{4(aq)} \rightarrow CaCO_{3(s)} + Na_2SO_{4(aq)}$$

$$Na_2CO_{3(aq)} + MgSO_{4(aq)} \rightarrow MgCO_{3(s)} + Na_2SO_{4(aq)}$$

(b) Using Sodium Zeolite: (an ion Exchange)

Sodium zeolite is a naturally occurring resin of sodium aluminium silicate $NaAl(SiO_3)_2$, which can also be prepared artificially. It is used for softening of water at domestic as well as on industrial scale. When water is passed through resin, sodium ions of the resin are exchanged with the unwanted calcium and magnesium ions of the hard water.

$$Na_2 \text{ zeolite} + CaSO_{4(aq)} \rightarrow Ca \text{ zeolite} + Na_2SO_{4(aq)}$$

When resin is fully used up, it can be regenerated by flushing it with concentrated solution of NaCl. The reverse process takes place because of high concentration of sodium ions.

$$Ca \text{ zeolite} + 2NaCl \rightarrow Na_2 \text{ zeolite} + CaCl_2$$